Impact of Solid Waste on Environment and Social Life in Ranchi Municipal Corporation

SYNOPSIS FOR THE Ph.D. REGISTRATION IN GEOGRAPHY

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CONSENT OF THE SUPERVISOR

I hereby give my consent to supervise the candidate (Prity Pathak) on the proposed synopsis: Impact of Solid Waste on Environment and Social Life in Ranchi Municipal Corporation Leading to a Ph.D. degree of the University. I further certify that the synopsis referred to above is to the best of my knowledge and the information has not been published and submitted elsewhere for the award of any diploma or degree.

Date:

Place: Ranchi

Signature of the Supervisor

A BRIEF INTRODUCTION OF THE RESEARCH TOPIC

The term solid waste and its management mainly refers to the complete process of collecting, treating and disposing off solid wastes.

In the waste management process, the wastes are collected from different sources and are disposed of. This process includes collection, transportation, treatment, analysis and disposal of waste. It needs to be monitored so that strict regulations and guidelines are followed to be.

Solid waste can be classified by the municipality as industrial, agricultural, medical, mining waste and sewage waste. Municipal solid waste accumulates on different place due to improper management.

Solid waste elements are those substances which become useless after use. These are called solid waste materials. These include household waste like newspapers, boxes, canisters, polythene bags, ashes, household garbage etc. Sufficient space is required for proper dumping and disposal of solid waste. Growing Urbanization and industrialization are also important factors in the increase of solid waste and it is also having a negative impact on the environment. Solid waste management and planning is an important part of the infrastructure of any city or town, which helps in reducing the quality of waste to be disposed off. If solid waste is not disposed of properly, it has a negative impact on the environment and health.

In rapidly urbanizing cities like Ranchi, the effective management of solid waste has become a crucial challenge. Growing populations, expanding urban boundaries, and increased consumption, generate high volume of waste, increasing pressure on existing waste management infrastructure. Inefficient solid waste management not only leads to environmental degradation, including soil, water, and air pollution, but also impacts public health, quality of life, and socioeconomic conditions, of the city dwellers. This research aims to assess the

environmental and social impacts of current solid waste management practices in Ranchi Municipal Corporation and explore sustainable pathways that can enhance environmental protection, public health, and social equity.

STATE OF THE ART

Rates of solid-waste generation vary widely. In the United States, for example, municipal refuse is generated at an average rate of approximately 2 kg (4.5 pounds) per person per day. Japan generates roughly half this amount, yet in Canada the rate is 2.7 kg (almost 6 pounds) per person per day. In some developing countries the average rate can be lower than 0.5 kg (1 pound) per person per day. India generates an average of 0.5 kilograms of solid waste per person per day in large cities, with smaller cities generating around 0.1kg and medium cities between 0.3-0.4kg per person per day. Ranchi Municipal Corporation generated 450-500 grams waste per day. These data include refuse from commercial, institutional, and industrial as well as residential sources. The actual rates of refuse generation must be carefully determined when a community plans a solid-waste management project. (1)

The books and research available as literature on solid waste can be analysed in this way-

Albanel, E.J. Plaxistas and T. Cabrero (1988) Chemical changes during vermicomposting of sheep manure mixed with industrial cotton waste. Important book on biology and soil fertility. However, reports on chemical changes occurring during the decomposition of organic wastes by earthworm activities are rare. (2)

Federick-son A.al, 1997.Research on vermicomposting of a wide variety of wastes is gaining momentum worldwide. (3)

Mitchell, A. (1997) Isonia fedira and vermicompost production from feedlot cattle manure. In the present state of environmental protection,

vermicomposting technology provides recovery of valuable resources such as manure from such biodegradable wastes. Vermicomposting is a process of producing vermicompost from the activities of earthworms, the process of vermi-stabilization occurs due to microbial decomposition of organic matter inside the gut of earthworms, thus the undigested excreta of earthworms does not decompose rapidly. (4)

Earthworms by Kel.R.D. (1998) are important books for the use of organic waste such as Nature's Gift, Earthworm Ecology, Domestic kitchen waste is one of the major sources of municipal solid waste. In India, domestic waste is mostly of organic nature and urban solid waste are of organic nature. Contributes 70-80% A household of four members generates 0.5- 0.75 kg of kitchen waste per day. (5)

Kyoto Protocol (1998) While incineration and landfill are by far the most widely used means of solid waste disposal worldwide, landfilling of biodegradable waste has been proven to contribute to environmental degradation, primarily through the production of highly polluting leachate and methane gas. (5) Methane is one of the six greenhouse gases responsible for global warming that need to be reduced to tackle climate change under the Kyoto Protocol (U.N.A. 1998). Methane emissions from landfills account for about 30% of global anthropogenic emissions of methane into the atmosphere. (6)

Analysis of Urban Solid Waste in Developing Countries: A Perspective on Bangalore, India Working Paper No. 24, Collaborative Research in Environmental and Development Economics Social and Economic Change etc by Van Vuekering P.M. Sehkar, R. Rayer Gerlagh V. Kumar (1999). “A review of the existing literature reveals that a number of studies on SWM have been carried out even before 1970.”
(7)

Agricultural Sustainability and Sustainable Production Practices by A. Tilman, D.K.G. Cassman, P.A. Mattson, R. Nallair and S. Polsky (2002) is an important publication in Nature. In recent years, growing consumer concern about issues such as food quality, environmental safety, and currency conservation has led to a substantial increase in the use of sustainable agricultural methods. Sustainable agriculture can be defined as a set of practices that conserve resources and the environment without compromising human needs, with the use of organic fertilizers and animal feed as its main pillars. (8)

Shafiul, A.A. and A. Masoor (2003) have stated that with the rise of towns and cities where large number of people have come to gather in relatively small areas in search of livelihood, waste disposal has become problematic, their book Partnership for Solid Waste Management in Developing Countries (Development

Engineering Institute, etc) is important. (9)

Hammer G. (2003), Solid Waste Treatment and Disposal: Effects on Public Health and Environmental Safety, Biotechnology Advances etc is an important book. There is no doubt that untreated solid waste often contains components that can cause infectious diseases. Such levels have not yet been assessed on a large scale, but existing treatment processes can either completely or consistently eliminate such risks. (10)

Ogawa, H. (2005) The typical solid waste management system in developing countries is plagued by a number of problems including low collection coverage and irregular collection services, open dumping of crude oil, and burning without air and water pollution controls, important book by Ogawa Sustainable Solid Waste Management in Developing Countries is important. (11)

Regarding the waste management hierarchy, it is important to add that in developing countries the vast majority of waste is simply dumped in an uncontrolled manner or, worse, burned in the open. These practices are clearly not what the hierarchy principle should be striving for. Earlier studies show that the main consideration of management by public authorities is the quick removal and destruction of waste. This view was put forward by Melosi (2005) in his important volume Waste in Cities: Waste Remediation and the Environment. (12)

Livestock production waste storage and farm analysis of pathogen levels and prevalence in manure, Applied and Environmental Microbiology by Hutchison M.L.,
L.L.D. Walters, S.M. Avery, F. Munro and A. Moore (2005) highlights the topic. The use of feedstock in agriculture is being abandoned because of the concerns about growth and the environmental problems associated with indiscriminate and inappropriately timed application of feedstock. (13)
Rathi. S (2006) Mudai "Accumulation of waste is due to poor collection and inadequate transportation, Municipal management is passing through a critical phase due to the non-availability of suitable facilities for treatment and disposal of the large quantity of SWM (solid waste material) generated daily in metropolitan cities, unscientific disposal adversely affects all components of environment and human health. (14)

Sajjad Haider and Junaid Masood (2011) attempted to find a technique to reduce the amount of solid waste that needs to be collected and dumped and for this purpose, studied composting of kitchen waste. (15)

Pandey, H (2014) Cleaning up waste contamination in the long run is much more expensive than preventing it at source) Pandey G's important book Handbook of Waste to Resource Management is important. A factor

contributing to environmental pollution is improper waste management. Solid Waste SWM uses the 5-R concept of "Reduce, Reuse, Recover, Recycle and Remanufacture" to reduce the amount of waste that needs to be disposed of. (16) Bhattacharjee H. (2014) has published important books and journal articles like The Measures to deal with bio-medical waste on a large scale, lax implementation of laws, violation of constitutional rights, impact on ecology and health: The Indian Scenario. (17)

In this era of globalization, it is important to recognize the interdependence of environment, development, law and most importantly human health. The Medical Waste (Handling and Management) Rules 2011, as amended from time to time, should be strictly enforced under the Environment Protection Act, 1986 and periodically monitored by the Central or State Pollution Control Boards. Surprise visits by representatives of these boards to hospitals or other healthcare facilities generating biomedical waste on a regular basis can reduce the menace. It is also recommended that any hospital or healthcare facility providing medical and diagnostic services should have a workshop for those who will be in charge of collecting, sorting and disposing of biomedical waste. (18)

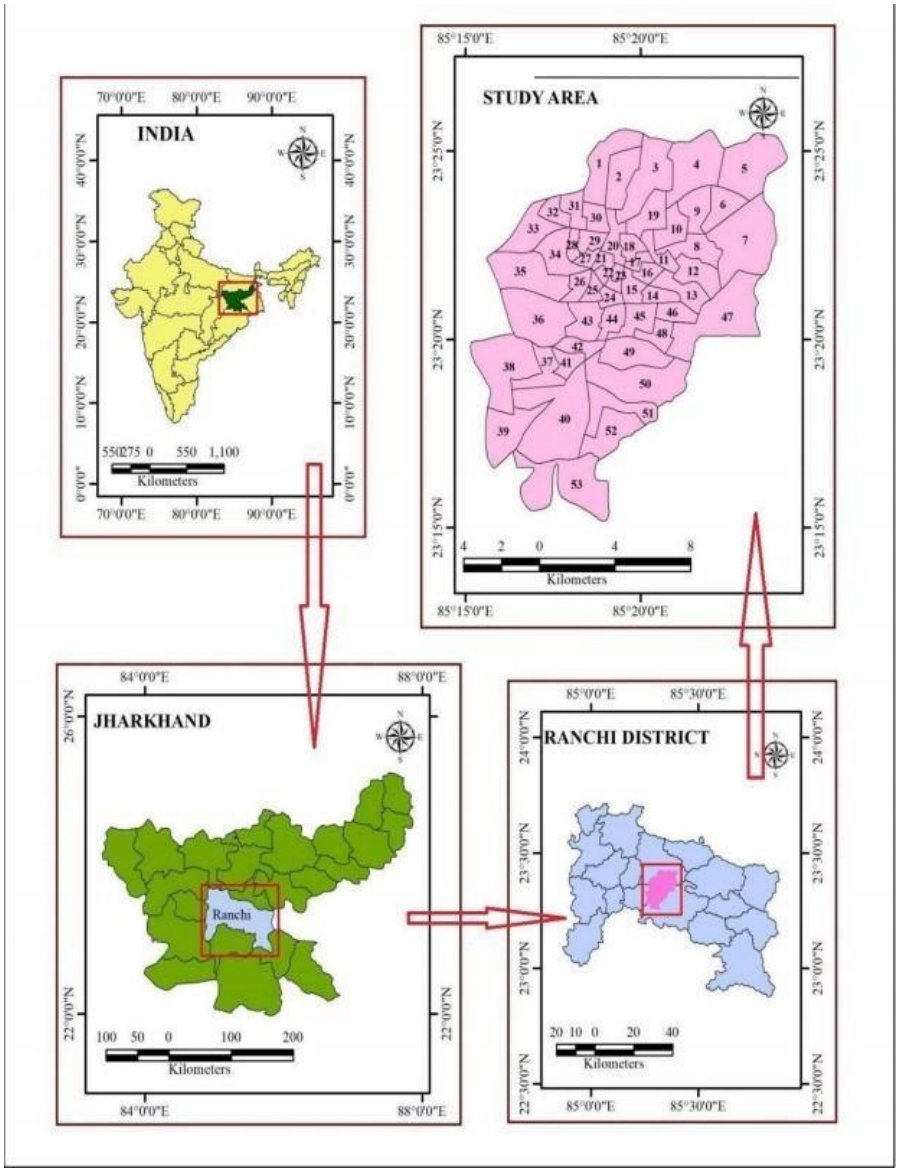
Research Gap Ranchi district needs to conduct a study regarding the solid waste material by providing suitable disposal facility, incineration, recycling etc. The government has to take more steps in the disposal of waste material and its management and development in the latest and most efficient way will also be important. We can bring about a significant change in its functioning and development.

ABOUT STUDY AREA

The study area of this research is Ranchi district, Ranchi is the capital of Jharkhand, which was separated from Bihar as the 28th state of India. Its height

(641m) from sea level is 2140 feet. Ranchi city is located in the southern part of Chota Nagpur plateau and in the centre of Ranchi. It is located between 23°15′0" North to 23°25'00" North latitude and 85°15'00" East to 85°26′00″ East longitude. The municipal corporation in Ranchi district covered an area of 6.5 square kilometres in 1869, which included Chadri, Kanke, Siram Toli, Lalpur, Chutia, some parts of Hatma, Morabadi, Old Ranchi and some parts of hindapiri. At present there are a total of 55 wards in Ranchi Municipal Corporation and its area is 175.12 square kilometers. Ranchi is the third largest municipal corporation in Jharkhand. According to the census of year 2011, the total population of Ranchi Municipal Corporation is 10,73,427 in which 5,58,872 are male and 5,14,555 are female, the population of children aged 0-6 years in Ranchi Municipal Corporation is 1,26,863 in which 66,793 are male and 60,070 are female. The total population of literate people in Ranchi Municipal Corporation area is 8,27,033 in which 4,51,069 are male and 3,75,964 are female. The number of illiterate people in Ranchi Municipal Corporation area is 2,46,394 in which 1,07,803 are male and 1,38,591 are female. The population density of Ranchi Municipal Corporation is 6130 persons per square kilometers and the population growth rate is 26.7%. According to the 2011 census, 77.04% of the people in Ranchi district are literate, of which 54.54% are male and 45.45% are female.

LOCATION MAP OF THE STUDY AREA



Source: Survey of India and Ranchi Master Plan, 2015

PROBLEMS TO BE INVESTIGATED

Every research problem is different according to the subject of study and is in the form of questions.

a) What impact does solid waste have on the environment?

b) What kind of impact does improper disposal of waste have on the area?

c) What impact has the collection of waste material had on the quality of the environment?

d) Is there a problem related to recycling of solid waste?

e) Is there a problem related to negative attitude of citizens towards disposal of solid waste?

f) What is the problem related to the action plan for solid waste management in Ranchi Municipal corporation?

OBJECTIVE OF THE INVESTIGATION AND MOTIVATION

- To evaluate the environment impacts of current solid waste management practices in Ranchi Municipal Corporation.
- To assess the social implications of existing solid waste management practices, particularly concerning public health, community well-being, and social equity.
- To identify and analyse key challenges faced in implementing effective solid waste management, such as infrastructure limitations, resource constraints, and community participation.
- To propose sustainable solutions and path for Ranchi Municipal Corporation which can improve solid waste management practices, minimize environmental impacts, and promote social benefits within Ranchi Municipal corporation

RESEARCH QUESTIONS

1. What are the major environmental impacts of the current solid waste management practices in Ranchi, particularly concerning soil, water, and air quality?
2. How do waste disposal and management methods contribute to pollution levels and environmental degradation within Ranchi Municipal Corporation?
3. How do current solid waste management practices affect public health, safety, and quality of life for Ranchi Municipal Corporation residents, particularly in low-income or vulnerable communities?
4. What is the level of public awareness and participation in existing waste management programs in Ranchi?
5. What are the primary operational and policy challenges Ranchi municipal corporation faces in implementing efficient and sustainable solid waste management practices?
6. How do factors such as infrastructure, financial resources, and community engagement impact the effectiveness of waste management in Ranchi municipal corporation?
7. What sustainable solid waste management practices can be adopted by Ranchi municipal corporation to reduce environmental impacts and improve public health outcomes?
8. How can community involvement and awareness programs be enhanced to support sustainable waste management in Ranchi?

RESEARCH HYPOTHESIS

1: Current solid waste management practices in Ranchi municipal corporation contribute significantly to environmental degradation, including soil, water, and air pollution.

2: Inadequate solid waste management practices negatively impact public health, particularly in vulnerable communities, due to increased exposure to pollutants and waste-related hazards.

3: Ranchi municipal corporation faces substantial challenges in waste management due to inadequate infrastructure, limited financial resources, and insufficient community participation.

4: Implementing sustainable waste management solutions, including recycling, waste segregation, and public awareness programs, can significantly mitigate environmental impacts and improve social well-being in Ranchi.

RESEARCH METHODOLOGY

An empirical cum statistical approach (Mix-method approach) will be adopted to gather quantitative and qualitative data on solid waste management practices and their impacts within Ranchi Municipal Corporation. The entire research should be understandable through the following methodological steps

1. Literature Review: The literature review will cover the following key areas: Environmental Impact of Solid Waste Management: Studies that outline how improper solid waste management practices contribute to pollution, greenhouse gas emissions, and ecosystem degradation.

Social and Public Health Implications: Examination of the ways in which inadequate solid waste management affects public health, especially in urban

areas, through the spread of diseases, contamination of water sources, and air pollution.

Challenges in solid waste management in Indian Urban Contexts: Review of common barriers such as limited funding, lack of technological infrastructure, insufficient waste segregation, and the need for greater community involvement in Indian cities.

Sustainable solid waste management Practices: Case studies and best practices from other cities, both in India and globally, that have successfully addressed solid waste management challenges through sustainable solutions like recycling, composting, and community driven waste reduction initiatives.

2. Data Collection: The study is based on primary and secondary source of investigation.

Quantitative Data: Collection of data on waste generation, composition, and disposal methods from Ranchi Municipal Corporation records, as well as environmental quality data (e.g., air and water pollution levels) from environmental agencies and satellite imageries.

Qualitative Data: Interviews with Ranchi municipal corporation officials, waste management workers, community members, and other stakeholders to understand challenges, impacts, and potential solutions.

Field Observations; Sample Survey and Case Studies: Sample site visits to major landfills, transfer stations, and informal waste collection areas to observe waste handling processes, conditions, and any environmental degradation before selecting the samples. Random purposive sampling method have been used for the selection of samples in Ranchi municipal corporation. Some data will gather through temporal analysis of satellite and Aerial Imageries interpretation

Sample Survey of Local Residents: Sample survey will be conducted in different selected wards that is 1ward × 10 households, 10×30 ward=300 households' samples to assess public awareness and satisfaction with Solid Waste Management services, focusing on perceptions of cleanliness, health, and safety.

3. Data Analysis: Data analysis will be done through different statistical techniques and GIS tools. Such as: Environmental Analysis: Use of GIS tools and environmental indicators to map pollution levels in affected areas. Social Impact Analysis: Thematic analysis of qualitative data from surveys and interviews to highlight key social issues and challenges faced by residents.
4. Data Representation and Documentation: The analysed results are thoroughly represented and documented using maps, charts, diagrams, and tables, with clear descriptions of the findings in each respective chapter.

TENTATIVE CHAPTERISATION

Chapter Outline: The proposed structured outline of the chapters for the topic Impact of "Solid Waste on Environment and Social Life in Ranchi Municipal Corporation" is as follow:

Introduction

Chapter 1: Geographical Profile of the Study Area

Chapter 2: Existing Solid Waste Management System in Ranchi Municipal Corporation.

Chapter 3: Environmental impacts of solid waste management in Ranchi Municipal Corporation.

Chapter 4: Impacts of Solid Waste Management on social life of Ranchi Municipal corporation.

Chapter 5: Challenges in Solid Waste Management in Ranchi Municipal Corporation.

Chapter 6: Sustainable ways for Improving solid waste management in Ranchi Municipal Corporation. Conclusion and suggestion

Glossary of terms
Bibliography

Expected Outcomes: The expected outcomes of the proposed research are as follow:

Detailed Assessment of Environmental and Social Impacts: The study will provide a comprehensive evaluation of how current solid waste management practices are affecting environmental quality (soil, water, air) and public health in Ranchi.

Identification of Key Challenges: The study will pinpoint specific issues within Ranchi municipal corporation waste management system, including infrastructure gaps, resource limitations, and community engagement barriers.

Proposed Sustainable Suggestion: This research will offer practical, evidence based recommendations for sustainable solid waste management strategies, including waste segregation, recycling, composting, and enhanced public awareness campaigns. These solutions will focus on creating a more environmentally sustainable and socially inclusive waste management model for Ranchi municipal corporation.

Policy Recommendations: Policy guidance will be provided for Ranchi municipal corporation, emphasizing regulatory improvements, technological adoption, and partnerships with private sector and non-governmental organizations for enhanced solid waste management.

SIGNIFICANCE OF THE STUDY

This research is expected to provide valuable insights into the environmental and social consequences of existing Solid Waste Management practices in Ranchi, contributing to urban planning, environmental policy, and public health discourse. By proposing sustainable pathways, the study will assist Ranchi municipal corporation in addressing waste management challenges and promoting a cleaner, healthier, and more sustainable urban environment. Studying the impact of waste material helps in planning and implementing its treatment.

a) Assist in studying the views of citizens.

b) Types of solid waste and what kind of impact it has on the environment, socially and economically. Studying this will help in its treatment.

c) Considering the status of the waste material, prepare a plan based on research and study to ensure measures for disposal of large amount of waste generated in future.

d) To help take important steps to dispose of the increasing generation of waste material.

ITS RELEVANCE TO PRESENT DAY PROBLEM AND NEED TO THE SOCIETY

Today, urbanization is happening rapidly everywhere in the world and a high percentage of urbanization is seen in developed countries. In comparison to this, the percentage of urbanization is increasing day by day in developing countries. Hence, the way urbanization is taking place in the developing countries, Population and urbanization have led to an increase in solid waste; today this problem has taken a grave form. The need of the hour is that this important subject should be studied and researched in detail and this will give information about the options to deal with the problem and the current situation, so that planning can be done accordingly.

CONTRIBUTION ON EXISTING KNOWLADGE

This research is expected to provide valuable insights into the environmental and social consequences of existing solid waste management practices in Ranchi, contributing to urban planning, environmental policy, and public health discourse. By proposing sustainable pathways, the study will assist Ranchi municipal corporation in addressing waste management challenges and promoting a cleaner, healthier, and more sustainable urban environment. The proposed study will establish a balance between solid waste and environment through analysis of information and solid waste in Ranchi, the capital of Jharkhand. Along with the main problem of the present time, the problem of waste disposal and its solution and its development and impact on the area and dumping area will also be studied. In developing countries like India, the waste disposal policy is not very effective, due to which research is required for its treatment is required.

FUTURE WORK

Here are some possible directions for future research

a) Research on Environmental Studies has emerged as an important subject for today and the future because there is a great need for research and treatment in the environment which is changing rapidly. Therefore, future research will help in its study.

b) Study of Citizens' Awareness This research allows for a detailed analysis of the attitude and perspectives of citizens of Ranchi region towards awareness.

c) Health and economic studies - Changes in environment caused by waste material have adverse effects on health and also lead to economic burden due to poor health. By studying this, future measures can be taken.

d) Helps in policy management of solid waste .We can take help of research on solid waste management for future policy planning.

e) To motivate towards activities related to environmental protection and safety.

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